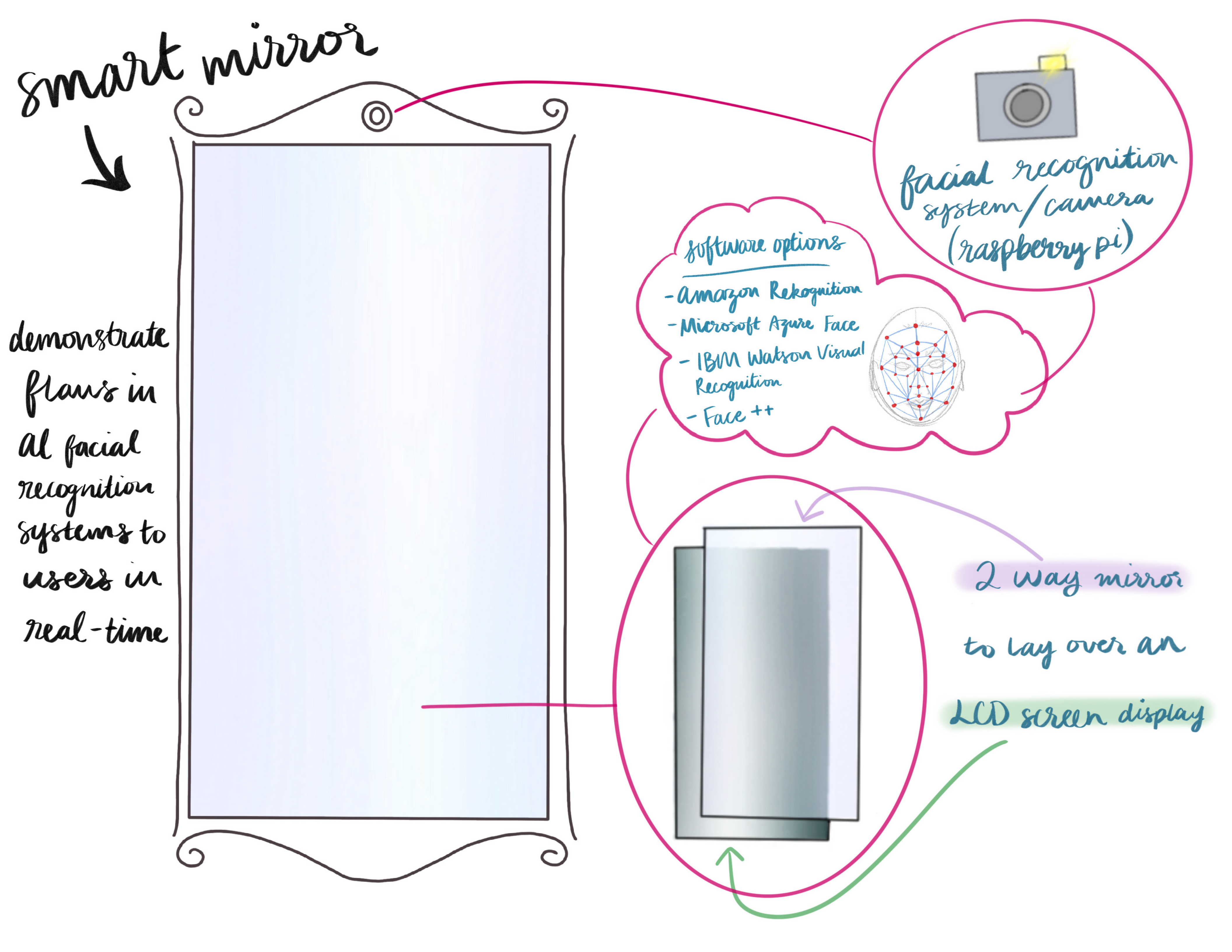
Truth Reflect

How might we uncover and highlight the flaws and algorithmic biases in AI systems?


smart mirror
demonstrate flaws in AI facial recognition systems to users in real-time
facial recognition system/camera (raspberry pi)
software options
- Amazon Rekognition
- Microsoft Azure Face
- IBM Watson Visual Recognition
- Face ++
2 way mirror
to lay over an
LCD screen display

Possible Displays

① predictions/classifications by facial recognition system

Number of faces: 1
Gender: Male
Age Range: 20 - 29
Ethnicity: Caucasian
Emotion: Happy

Tap on number(s) that are correct:

1 2 3 4 5

mirror

user-input · collect data to better examine survey · accuracy/flaws of facial data

user interaction to next page

Possible Displays Cont.

① Hypothetic results of facial data accuracy based on user-input survey from 1st screen

Mirror

Percentage Breakdown of Most Frequently/Accurately Recognized Faces

By Demographic:

Light-Skinned Males: 99% accuracy
Light-Skinned Females: 97% accuracy
Dark-Skinned Males: 94% accuracy
Dark-Skinned Females: 87% accuracy

By Ethnicity

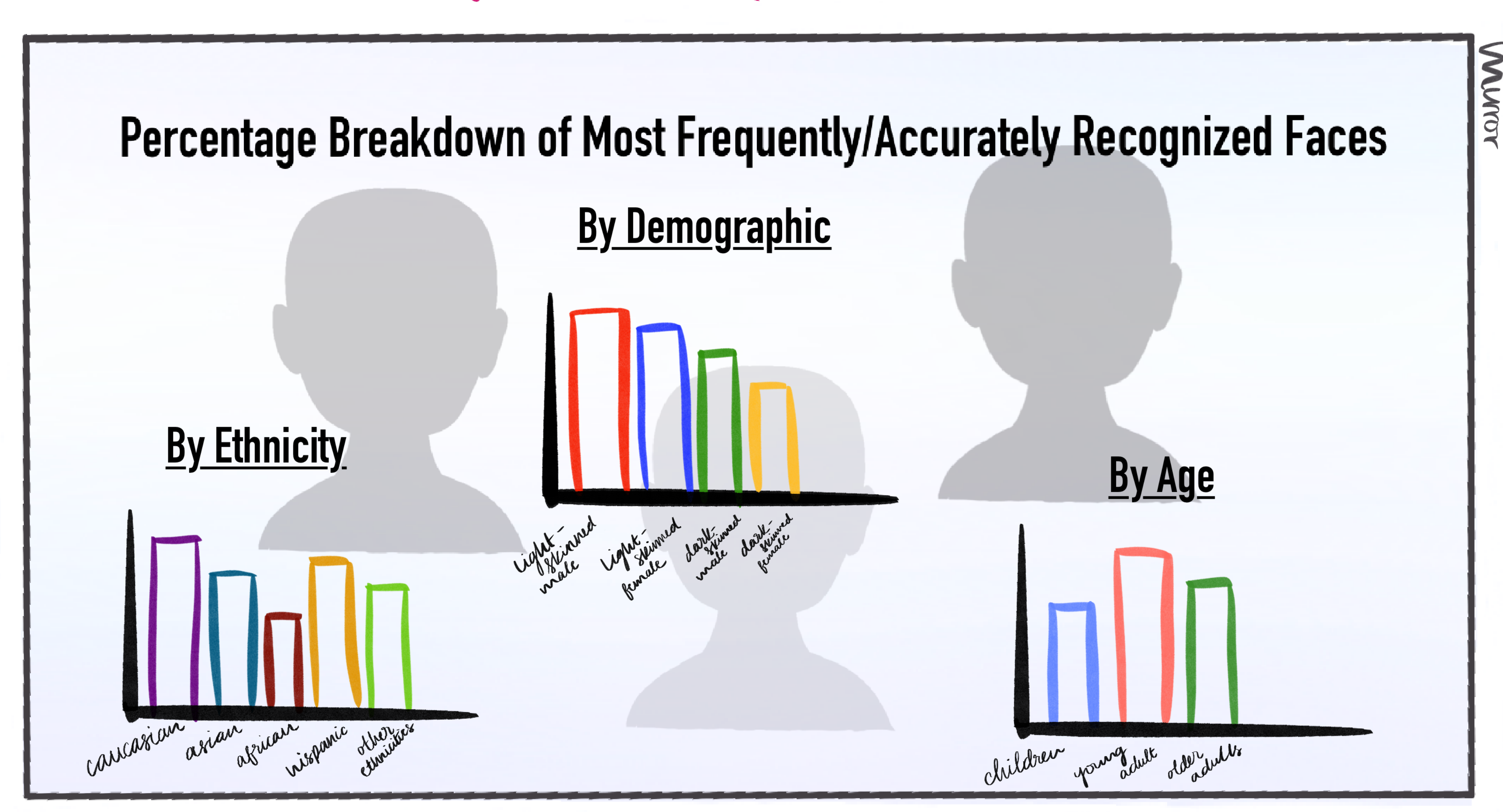
Caucasian: 98% accuracy
Asian: 95% accuracy
African: 91% accuracy
Hispanic: 96% accuracy
Other Ethnicities: 94% accuracy

By Age

Children (<20 years old): 92% accuracy
Young Adults (20-40 years old): 98% accuracy
Older Adults (>40 years old): 94% accuracy

Possible Displays Cont.

① alternative display of results (visual representation)



Possible Displays Cont.

② predictions/classifications by facial recognition system

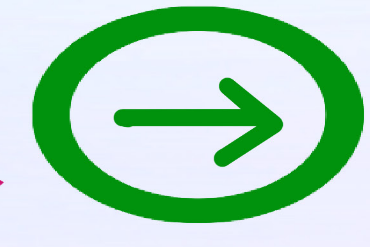
Gender: ______

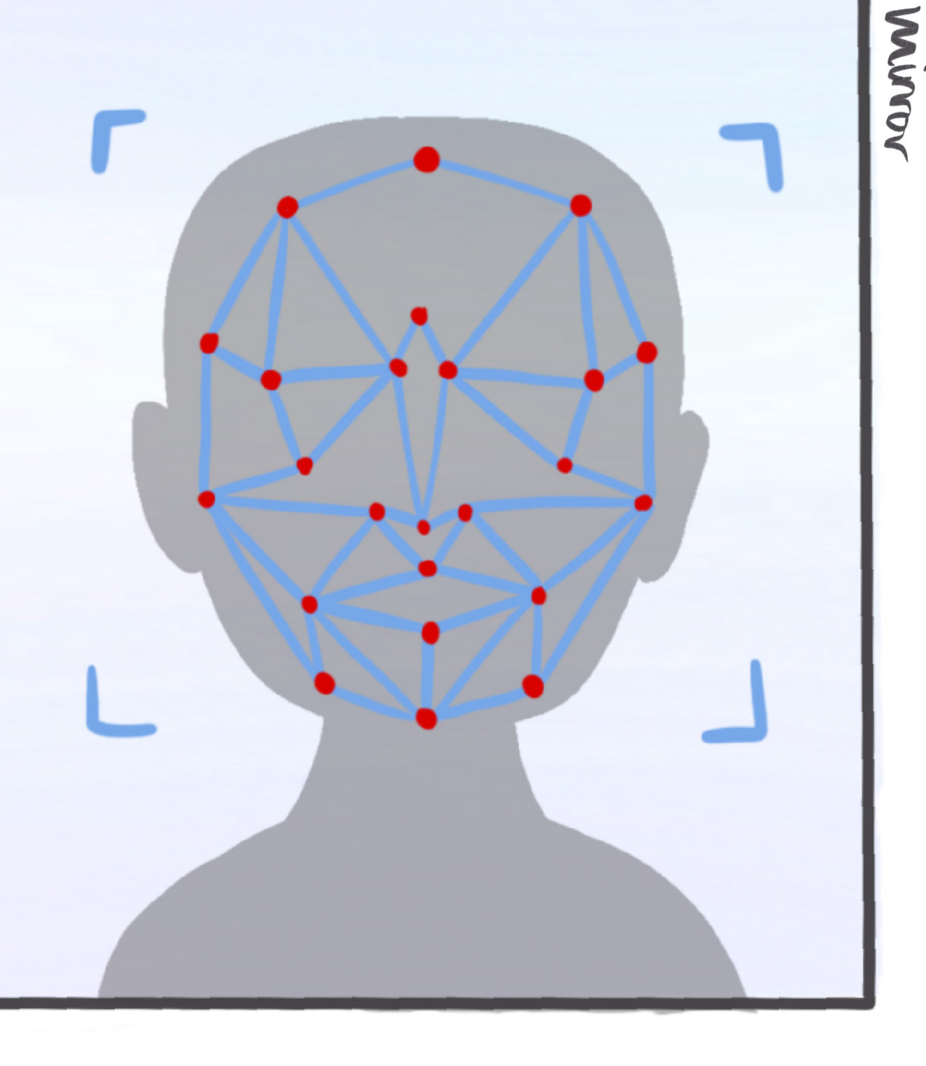
Ethnicity: ______

Age Range: ______

AI Confidence Level:

____%



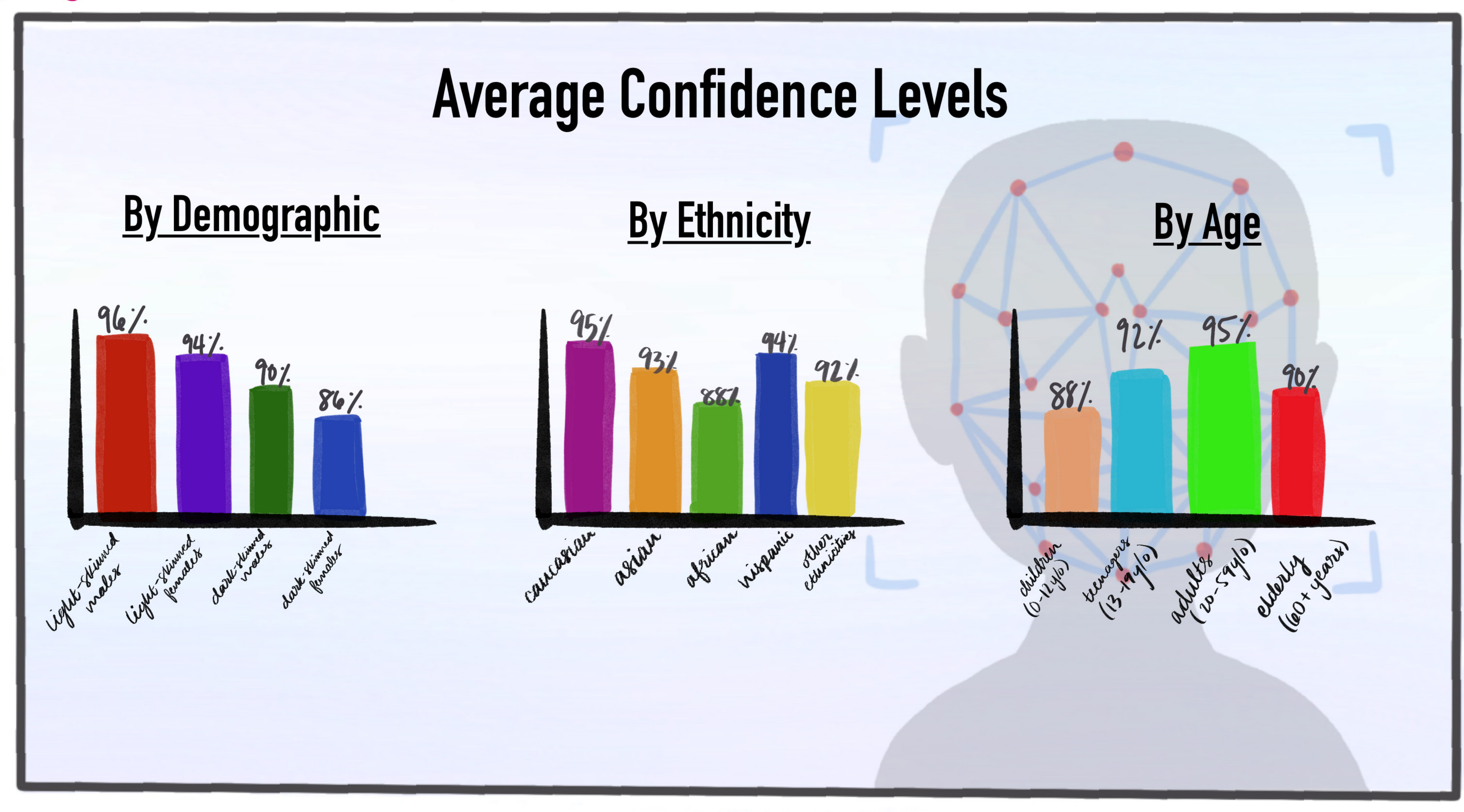


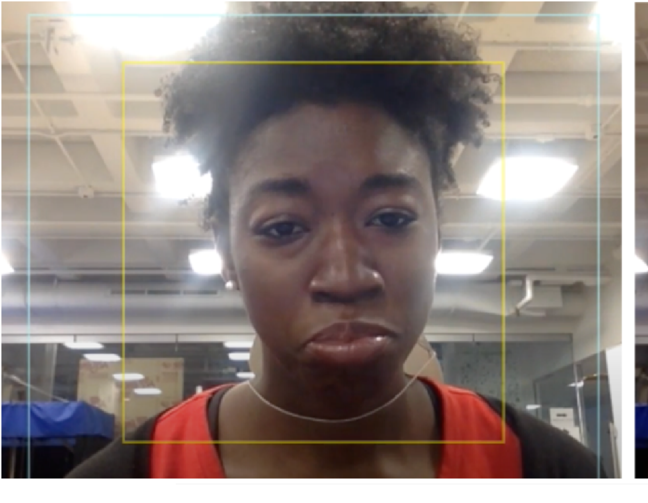
mirror

user interaction to next page

Possible Displays Cont.

② Hypothetic results comparing confidence levels for different demographics







To illustrate this, researcher Joy Buolamwini created a data set using 1,270 photos of parliamentarians from three African nations and three Nordic countries.

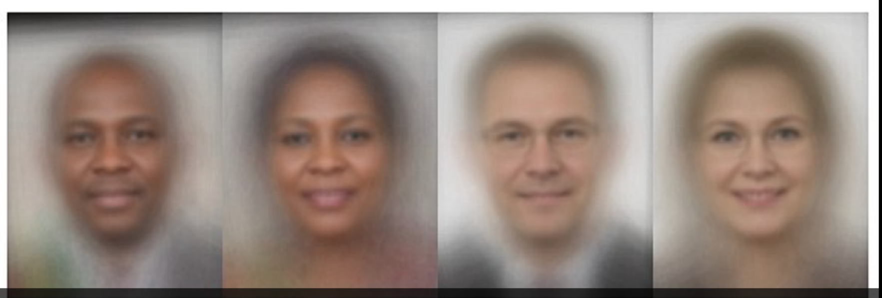
The faces were selected to represent a broad range of human skin tones, using a labeling system developed by dermatologists, called the Fitzpatrick scale.

The scale is viewed as more objective and precise than classifying based on race, **according** to the New York Times.

Buolamwini found that when the person in a photo was a white man, the facial recognition software worked 99% of the time.

But when the photo was of a darker skinned woman, there was a nearly 35% error rate.

Gender Classifier	Darker Male	Darker Female	Lighter Male	Lighter Female	Largest Gap
Microsoft	94.0%	79.2%	100%	98.3%	20.8%
FACE++	99.3%	65.5%	99.2%	94.0%	33.8%
IBM	88.0%	65.3%	99.7%	92.9%	34.4%



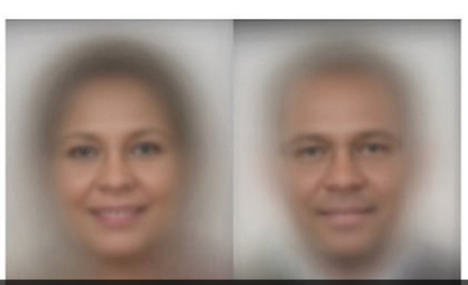
In a 2018 study titled Gender Shades, a team of researchers discovered that popular facial recognition services from Microsoft, IBM and Face++ can discriminate based on gender and race

sources

Research shows that facial recognition technology is less accurate when seeking to identify darker-skinned faces.

A study, which measured how the technology worked on people of different races and gender, found three leading software systems correctly identified white men 99 per cent of the time, but the darker the skin, the more often the technology failed.

Gender Classifier	Female Subjects Accuracy	Male Subjects Accuracy	Error Rate Diff.
Microsoft	89.3%	97.4%	8.1%
FACE++	78.7%	99.3%	20.6%
IBM	79.7%	94.4%	14.7%



Previous research looked at how facial recognition worked between different genders and races. Pictured, the researchers found that Microsoft, IBM and Face++'s systems were more likely to accurately identify a photo of a man instead of a photo of a woman

POTENTIAL HARMS FROM ALGORITHMIC DESCISION-MAKING

INDIVIDUAL HARMS: ILLEGAL DISCRIMINATION / UNFAIR PRACTICES	COLLECTIVE SOCIAL HARMS
HIRING	LOSS OF OPPORTUNITY
EMPLOYMENT	
INSURANCE & SOCIAL BENEFITS	
HOUSING	
EDUCATION	
CREDIT	ECONOMIC LOSS
DIFFERENTIAL PRICES OF GOODS	
LOSS OF LIBERTY	SOCIAL STIGMATIZATION
INCREASED SURVELLIANCE	
STEREOTYPE REINFORCEMENT	
DIGNATORY HARMS	

Chart Contents Courtesy of Megan Smith, Former CTO of the United States

Joy Buolamwini, who led the study, wrote about how biased AI can have 'serious consequences' such as those pictured, including illegal discrimination in hiring, firing and housing, as well as other impacts on social and economic situations



- “Fighting the ‘Coded Gaze:’ How We Make Artificial Intelligence Benefit All | #PublicInterestTech.” *YouTube*, YouTube, 13 Nov. 2018, www.youtube.com/watch?v=PaJIS1bMt8k.
- *Gender Shades: Intersectional Accuracy Disparities in Commercial Gender ...*, proceedings.mlr.press/v81/buolamwini18a/buolamwini18a.pdf. Accessed 18 Oct. 2023.
- Dailymail.com, Annie Palmer For. “Is Facial Recognition Technology Racist? Study Finds Popular Face ID Systems Are More Likely to Work for White Men.” *Daily Mail Online*, Associated Newspapers, 12 Feb. 2018, www.dailymail.co.uk/sciencetech/article-5382979/Study-finds-popular-face-ID-systems-racial-bias.html.
- Das, Sushi. “This Is the Group Most Likely to Be Misidentified by Facial Recognition.” *Is Facial Recognition Technology Worse at Identifying Darker-Skinned Faces than Lighter Ones? - ABC News*, ABC News, 14 Feb. 2020, www.abc.net.au/news/2020-02-04/fact-check-facial-recognition-darker-skin/11781192.